276(1): Simple Explanation of Orbital Precession with 3D Orbit Theory.

In three dimensions the orbit is:

$$r = \frac{\alpha}{1 + \epsilon \cos \beta} \quad -(1)$$

where

$$\tan \beta = \frac{L}{L_Z} \tan \phi \quad -(2)$$

Now assume that:

$$\beta = x \phi \quad -(3)$$

so:

$$r = \frac{\alpha}{1 + \epsilon \cos(x\phi)} \quad -(4)$$

This is a precessing orbit. In the solar system:

$$x = 1 + \frac{3MG}{\alpha c^2} \quad -(5)$$

to high experimental precision. Eqs. (2) and (3) mean that:

$$\tan x\phi = \left(\frac{L}{L_Z} \right) \tan \phi \quad -(6)$$

i.e.

$$\boxed{\frac{L}{L_Z} = \frac{\tan x\phi}{\tan \phi}} \quad -(7)$$

2) In the solar system and binary pulsar system

$$x \sim 1 \quad -(8)$$

to high precision. So for all ϕ, the precession constant x is the result of a very small change in the planar L_z to L. When:

$$L = L_z \quad -(8)$$

then

$$x = 1 \quad -(9)$$

and there is no precession

Specifically:

$$\boxed{x = \frac{1}{\phi} \tan^{-1}\left(\frac{L}{L_z} \tan\phi \right) = 1 + \frac{3mG}{\alpha c^2}} \quad -(10)$$

where

$$\alpha = \frac{L_z^2}{m^2 MG} \quad -(11)$$